

## **RISK ASSESSMENT: ESTIMATED DAMAGES IN HAZARD AREAS**

44 CFR Part 201.6 (c)(2)(ii)(B) states, “[The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare this estimate...” This section of the Plan is intended to satisfy this requirement.

### **Methodology**

The team attempted to assess vulnerability to various hazards within the limitations of the available data, where generally accepted measures of vulnerability are established. Parcel data included assessed values for land and total assessed values; assessed values for improvements were calculated by subtracting the land value from the total value. Expanding upon the parcel data in the county’s GIS to include such information as building square footage, year built, type, foundation type, and condition, would allow for a more accurate assessment of vulnerability. Including market values would also be helpful. Therefore, the Planning Group has considered actions in this regard. Please see further sections of this plan for additional information on actions considered and ultimately selected.

### **Estimated Damages – Coastal Erosion**

Sufficient data was not available at the time of the study to estimate coastal erosion damages. At this time, vulnerability is being expressed as the value of improvements in the current mapped CEHA as presented in the “Identification and Characterization of Assets” section of this plan.

First, there is some question as to specific erosion rates in specific parts of the study area depending on whether views current NYS CEHA mapping (circa 1988), or more recent USACE data (often in the range of 1-2 feet per year and generally not specific to community). For the purpose of this plan, the Planning Group has used what Nassau County and its jurisdictions are currently regulating to – the 1988 NYS CEHA mapping, which indicates no demonstrated long-term average annual recession rates of one foot per year or greater. When the CEHA maps are updated, any communities with demonstrated long-term average annual recession rates of one foot per year or greater should be identified for further consideration during that planning cycle.

Second, FEMA’s How-To #2 (FEMA #386-2), Page 4-30, states that “...current standard loss estimation models and tables for erosion damages are not available.” As a result, you may wish to simplify your consideration of structure damage so that buildings are assumed to be either undamaged or severely damaged due to erosion. Although slight or moderate damage can occur due to erosion, the likelihood of this level of damage is considered small.”

In the future, for any participating jurisdictions for which SHAs become delineated on the NYS CEHA maps, this section of the plan could be updated following general guidelines set forth in How-To #2.

In general terms, estimated damages due to coastal erosion could be severe, but are most likely only in the 16 coastal communities with mapped coastal erosion hazard areas, and only within the areas of those communities closest to the shoreline. On a county-wide basis 1,262 parcels (3,357 acres, or 1.49 percent of the land within the county) fall within mapped CEHAs. The assessed value of improved property on these parcels is equal to nearly \$4.85 million, roughly 2.1 percent

of the assessed value of all improved property county-wide. Out of a total of 602 emergency facilities, 2 police departments could be impacted by coastal erosion. Of 37 utilities, none are within the coastal erosion hazard area. Five (out of a total of 165) historic and cultural resources could be impacted by erosion. And, out of a total of 1,653,945 people living in Nassau County approximately 5,689 (0.34 percent) live within mapped erosion hazard areas. Again, additional details can be found throughout the “Asset Identification and Characterization” section of this plan.

### **Estimated Damages – Wave Action**

Sufficient data was not available at the time of the study to estimate damages due to wave action. At this time, vulnerability is being expressed as the value of improvements in the current mapped V-zone as presented in the “Identification and Characterization of Assets” section of this plan.

First, while FEMA methodologies do exist to estimate damages due to flooding in V-zones, specific methodologies are not presented to differentiate between what percentages of those damages are caused by flooding and what percentages are caused specifically by wave action. The US Army Corps of Engineers is currently testing a beta version of a new coastal storm damage model called *Beach-fx* which is capable of estimating wave damages. The model was developed by the Institute of Water Resources (IWR) and the Engineering Research and Development Center (ERDC). Should methodologies/models become available in the future, they could be incorporated into future updates of this plan.

Second, in order to employ methodologies for estimating damages due to flooding in V-zones, specific information is required for buildings such as first floor elevation, type of construction, foundation type, and details on any existing protective features. This data was not available as a part of the County GIS during this study.

Third, having even the year built data for each structure in the V-zone, one would be able to highlight structures built before codes and standards were adopted to make buildings more resistant to damage in the V-zone, thus being better candidates for mitigation. Without the year-built data, this can not be done.

If this information should become available in the future, it could be incorporated into future updates of the plan. While one could make some blanket assumptions at this time for loss estimation, this would likely yield erroneous data and acting upon it could result in an unwise use of limited resources.

In general terms, estimated damages due to wave action could be severe, but are most likely only in the portions of the 47 coastal communities with mapped V-zones. On a county-wide basis 3,025 parcels (3,029 acres, or 1.35 percent of the land within the county) fall within mapped V-zones. The assessed value of improved property on these parcels is equal to nearly \$11.82 million, roughly 1.57 percent of the assessed value of all improved property county-wide. Out of a total of 602 emergency facilities, none fall within mapped V-zones. Of 37 utilities, one water pollution control plant is within a mapped V-zone. Nine (out of a total of 165) historic and cultural resources could be impacted by wave action. And, out of a total of 1,653,945 people living in Nassau County approximately 4,100 (0.25 percent) live within mapped V-zones. Again, additional details can be found throughout the “Asset Identification and Characterization” section of this plan.

## Estimated Damages – Earthquakes

As stated previously in the plan in the Profile section, according to the Earthquake Hazard Map of New York State, there is a 10 percent chance over 50 years that an earthquake with a PGA of greater than 5%g will be centered within Nassau County and/or its participating jurisdictions. This earthquake, if it were to occur, would likely have associated with it light to moderate perceived shaking and little to no damage. Therefore, a full earthquake loss estimation was not conducted at this time.

Examples of the types of damages that could be observed include:

- ⇒ Felt indoors by many, outdoors by few during the day
- ⇒ At night, some awakened.
- ⇒ Dishes, windows, doors disturbed and possibly broken
- ⇒ Walls make cracking sounds
- ⇒ Unstable objects could be overturned
- ⇒ Sensation like heavy truck striking building
- ⇒ Standing automobiles rocked noticeably

For earthquakes, the hazard is uniform county-wide and therefore all assets could be impacted. At this time, vulnerability is being expressed as the assessed value of improvements in the mapped earthquake hazard area, as presented in the “Identification and Characterization of Assets” section of this plan.

FEMA’s How-To #2 suggests that for earthquake loss estimation, data regarding building type, type of foundation, building code design level, and date of construction, is required for a quality analysis. This is because certain structures are more susceptible to earthquake damage than others. Older buildings, built before standard building codes went into effect, are more susceptible to earthquake damage. Similarly, unreinforced masonry buildings are more likely to sustain earthquake damage. While extensive damage to even these structures is unlikely, identifying this subset of buildings is important, particularly with regard to critical facilities that may meet these criteria. This information was not readily available at the time of the study for Nassau County and its participating jurisdictions.

Given these limitations, for planning purposes, the Planning Group has presented earthquake losses on a County-wide basis using data from the State’s HAZUS run for Nassau County, for this version of the plan. In the New York State Hazard Mitigation Plan, HAZUS-MH was used to estimate building exposure and potential earthquake losses for various return periods (2500-, 1000-, 500-, and 250-years) in each of the State’s counties. Results of the State’s analysis for Nassau County are presented in Table 40. The term “total exposure” is used in HAZUS; this represents an estimation of building replacement value, using estimates for typical buildings in a given census block.

**Table 40**  
**Earthquake Loss Estimation For Nassau County**  
*Source: New York State Hazard Mitigation Plan*

Community	Total Exposure	2500-Year Losses	1000-Year Losses	500-Year Losses	250-Year Losses
Nassau County, per HAZUS	\$109,313,341,000	\$5,723,355,000	\$1,583,463,000	\$429,131,000	\$84,883,000
Percentage	=Losses/Exposure *100	5.24%	1.45%	0.39%	0.08%

There are certain limitations to using HAZUS. First, it is only as current as the Census data imported in the model (Census 2000). Improved property in Nassau County has increased due to development in the past 6 years, so building exposure and total damages would likely be higher than the model is reporting. Second, the default data in the model does not take into account building year built, square footage, or condition- three factors that would allow local officials to better evaluate earthquake losses in the future, as collecting such data will identify if structures and their improvements were built before or after earthquake resistant building code provisions were adopted.

### **Estimated Damages – Flood**

Sufficient data was not available at the time of the study to estimate damages due to flooding. At this time, vulnerability is being expressed as the value of improvements in the current mapped flood hazard areas as presented in the “Identification and Characterization of Assets” section of this plan.

First, while FEMA methodologies do exist to estimate damages due to flooding, specific information is required for buildings in order to employ these methodologies, such as first floor elevation, type of construction, foundation type, and details on any existing protective features. This data was not available as a part of the County GIS during this study.

Second, having even the year built data for each structure, one would be able to highlight structures built before codes and standards were adopted to make buildings more resistant to flood damage, thus being better candidates for mitigation. Without the year-built data, this can not be done.

If this information should become available in the future, it could be incorporated into future updates of the plan. While one could make some blanket assumptions at this time to use various tools for loss estimation, this would likely yield erroneous data particularly given the high density of development within Nassau County and the high degree of variation in type of development. Acting upon such rough estimates could result in an unwise use of limited resources.

Flooding (for the FEMA Mapped 100-Year Floodplain: Zones A, AE, V, VE). In general terms, estimated damages due to flooding could be severe, but are most likely only in the portions of the 48 communities with mapped 100-year floodplains. On a county-wide basis 38,449 parcels 39,510 acres, or 17.55 percent of the land within the county) fall within FEMA Q3-mapped 100-year flood zones. The assessed value of improved property on these parcels is equal to nearly \$186 million, roughly 12.84 percent of the assessed value of all improved property county-wide. Out of a total of 602 emergency facilities, 43 fall within mapped 100-year flood zones. Of 37 utilities, seven are within a mapped 100-year flood zone. Twenty-one (out of a total of 165) historic and cultural resources could be impacted during a 100-year flood. And, out of a total of 1,653,945 people living in Nassau County approximately 84,800 (5.13 percent) live within mapped 100-year flood zones. Again, additional details can be found throughout the “Asset Identification and Characterization” section of this plan.

Storm Surge Flooding (Category 1, 2, 3 and 4 Hurricanes). Based on mapping in the 1993 Hurricane Evacuation study, in general terms, estimated flood damages due to storm surge for even a Category 1 hurricane could be severe and widespread, particularly if the storm were to make landfall at high tide. Flood damages due to storm surge are most likely in the portions of

the communities with mapped surge zones. Table 41 summarizes exposure in the various surge zones, on a county-wide basis.

	<b>Total, Countywide</b>	<b>Category 1</b>	<b>Category 2</b>	<b>Category 3</b>	<b>Category 4</b>
Number of Parcels	416,419	29,827	81,311	105,437	133,717
Percent of Land	--	14.87%	20.70%	24.37%	27.44%
Assessed Value of Improved Property	\$752,965,224	\$58,316,356	\$131,639,824	\$174,923,325	\$217,203,062
Percent of Improved Property (by assessed value)	--	7.74%	17.48%	23.23%	28.85%
Number of Emergency Facilities	602	31	104	166	222
Number of Utilities	37	9	15	18	20
Number of Historic and Cultural Resources	165	9	24	30	35
Population	1,653,945	70,486	232,914	315,064	409,786
Percent of Population	--	4.26%	14.08%	19.05%	24.78%

### **Estimated Damages – Landslides**

Sufficient data was not available at the time of the study to estimate damages due to landslides. At this time, vulnerability is being expressed as the value of improvements in the current mapped landslide hazard area (of high susceptibility, low incidence) presented in the “Identification and Characterization of Assets” section of this plan.

First, according to FEMA’s How-To #2, current loss estimation methodologies are not available for estimating landslide damages. While the guide indicates that structures within a landslide hazard area could be assumed to be “severely” damaged and those outside could be assumed to be “undamaged”, applying this methodology would not be appropriate for Nassau County given that so much of the land in the County is within a mapped area of high susceptibility but low incidence. In addition, specific information would be required for buildings in order to employ these methodologies, such as type of construction, foundation type, and details on any existing protective features. This data was not available as a part of the County GIS during this study.

Second, having even the year built data for each structure, one would be able to highlight structures built before codes and standards (such as steep slope ordinances) were adopted to make buildings more resistant to landslide damage, thus being better candidates for mitigation. Without the year-built data, this can not be done.

If this information should become available in the future, it could be incorporated into future updates of the plan. While one could make some blanket assumptions at this time to use various tools for loss estimation, this would likely yield erroneous data particularly given the high density of development within Nassau County and the high degree of variation in type of development. Acting upon such rough estimates could result in an unwise use of limited resources.

In general terms, estimated damages due to landslide could be severe, but are most likely only in isolated portions of the 44 communities with mapped landslide hazards (high susceptibility, low



incidence). On a county-wide basis 53,232 parcels (54,814 acres, or 30.19 percent of the land within the county) fall within mapped landslide hazard areas of high susceptibility and low incidence. The assessed value of improved property on these parcels is equal to nearly \$138 million, roughly 9.53 percent of the assessed value of all improved property county-wide. Out of a total of 602 emergency facilities, 89 fall within mapped landslide hazard areas of high susceptibility and low incidence. Of 37 utilities, five are within a mapped landslide hazard area. Eighty-three (out of a total of 165) historic and cultural resources could be impacted by a landslide. And, out of a total of 1,653,945 people living in Nassau County approximately 156,542 (9.46 percent) live within a mapped landslide hazard area. Again, additional details can be found throughout the “Asset Identification and Characterization” section of this plan.

### **Estimated Damages – Drought**

Crop failure is one common affect of drought. According to the 2002 Agriculture Census for Nassau County, only 495 acres in Nassau County represents cropland (0.77 square miles). Of this, 483 acres (0.75 square miles) are used for harvesting crops and 12 acres (0.02 square miles) are used for pastureland or grazing. Losses to crops in Nassau County would be minimal.

Water supply shortages are a second affect of drought. Nassau County gets most of its water from underground aquifers. Because underground aquifers are fairly resistant to the impacts of short-term droughts (the most likely type of drought to occur in Nassau County), the expected likelihood of future losses associated with reductions in water supply would be low.

A third common affect of drought is fish and wildlife mortality. Because so much of the land area in Nassau County is developed, fish and wildlife habitat is fairly low and therefore losses to fish and wildlife would likely be low.

A fourth common affect of drought is wildfires. Wildfires are not likely to occur in Nassau County. Small brushfires are possible, however. The expected likelihood of future losses during a drought as a result of brushfires is relatively low on a county or community level. However, losses in the particular location of the fire could be quite severe, particularly in areas where transportation or utilities are located.

Island Park reported that areas along Long Island Railroad (and homes and businesses along the tracks), the large area around the Keyspan Power Station, and the natural gas line location, include areas of brush which could catch fire particularly during a drought.

Hewlett Harbor reported droughts affecting the local golf club.

### **Estimated Damages – Extreme Winds**

Sufficient data was not available at the time of the study to estimate damages due to extreme winds. At this time, vulnerability is being expressed as the value of improvements exposed to the hazard, as presented in the “Identification and Characterization of Assets” section of this plan.

First, while FEMA methodologies do exist to estimate damages due to extreme wind, specific information is required for buildings in order to employ these methodologies, such as first floor elevation, type of construction, foundation type, and details on any existing protective features. This data was not available as a part of the County GIS during this study.

Second, having even the year built data for each structure, one would be able to highlight structures built before codes and standards were adopted to make buildings more resistant to wind damage, thus being better candidates for mitigation. Without the year-built data, this can not be done.

If this information should become available in the future, it could be incorporated into future updates of the plan. While one could make some blanket assumptions at this time to use various tools for loss estimation, this would likely yield erroneous data particularly given the high density of development within Nassau County and the high degree of variation in type of development. Acting upon such rough estimates could result in an unwise use of limited resources.

### **Estimated Damages – Severe Weather Events: Hurricanes/Tropical Storms, Tornadoes, Winter Storms/Ice Storms**

Severe weather ‘events’ have certain hazards associated with them, as discussed throughout the Hazard Profile section of this plan. Please see Estimated Damages for the specific hazards associated with a given event.

### **Summary**

Because in many cases sufficient information was not available to perform detailed assessments of estimated losses for a certain hazard, the following table is a useful tool to summarize vulnerability in terms of assets exposed. This is a summary of information presented in detail in the section of this plan entitled “Asset Identification and Characterization”, and also in the detailed tables of Appendix A.

<b>Hazard</b>	<b>Percent of Improved Property Exposed</b>	<b>Number of Emergency Facilities Exposed</b>	<b>Number of Utilities Exposed</b>	<b>Number of Historic/Cultural Resources Exposed</b>	<b>Population Exposed</b>	<b>Percent Area Exposed</b>
Coastal Erosion (mapped CEHA)	2.1%	2	0	5	5,689	1.49%
Wave Action (100yr)	1.6%	0	1	9	4,100	1.35%
Earthquakes	100%	602	37	165	1,653,549	100%
Flooding (100yr)	12.84%	43	7	21	84,800	17.55%
Surge, Cat1	7.74%	31	9	9	70,486	14.87%
Surge, Cat2	17.48%	104	15	24	232,914	20.70%
Surge, Cat3	23.23%	166	18	30	315,064	24.37%
Surge, Cat4	28.85%	222	20	35	409,786	27.44%
Landslides	9.53%	89	5	83	156,542	30.19%
Drought	100%	602	37	165	1,653,549	100%
Extreme Winds	100%	602	37	165	1,653,549	100%